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Water in the United States

Though the average man drinks less than half a gallon of liquid in the course of a day, the daily per capita use of water for domestic and industrial purposes in the United States is over a thousand gallons. Most urban dwellers are so accustomed to turning on the tap when they need water, that they are inclined to take the supply for granted, and only start worrying when asked to save water because reservoirs are low, or when flooded out of their homes.

When the city dweller stops to think of it he acknowledges with pride that man's engineering skill has performed miracles in making water available in abundance to him. But though he is well aware that the farmer needs water to grow the nation's food, he is inclined to ignore the fact that without water he would be denied his automobile and television set. It takes for instance 65,000 gallons of water or 270 tons to process one ton of steel, a fact of the utmost significance in these precarious times.

The rural dweller, on the other hand—the forester, the rancher, and the farmer—is generally aware of his local situation. Wells dry up, fire hazards are increased, and vegetation growth is retarded or prevented in periods of drought; floods destroy crops, and cover the good topsoil with sterile sediment. When these inconveniences and troubles occur, both city dweller and farmer are inclined irritably to blame the government or the weather, and leave it at that.

Nevertheless, though floods and droughts can never be entirely prevented, people can learn how best to distribute themselves, their agriculture, and their industry to take full advantage of available water supplies. The fundamental question is: how much water is there, and where?

In Figure 1 the United States is divided into climatic belts based on average rainfall and evaporation statistics. These range from the humid areas of the east and northwest, formerly the lands of the great forests, to the desert or near-desert regions of the southwest. The sub-humid regions are the grass-covered prairies and parts of the Far West. Most of the country west of the prairies is arid or semi-arid. It is in the semi-arid areas that farming is precarious, because here the rainfall is not only small but unpredictable. In arid regions, on the other hand, there can be no delusions about farming possibilities. Land must either be artificially irrigated or left alone.

Figure 2 shows the distribution of the climatic belts for an exceptionally dry year (1934). The arid climate was vastly extended in the interior of the country. It climaxed a long series of misfortunes and man-made mistakes that created the famous Dust Bowl.

Rainfall statistics do not, however, give the whole

picture, because water circulates between the sea, the atmosphere, and the land in an extremely complicated manner. Rain water that is not evaporated, or that does not run off immediately into streams, sinks into the ground. Vegetation through its roots absorbs some of this ground water, and transpires most of it back into the atmosphere. Some of the ground water reaches the sub-soil and permeable rocks beyond the reach of vegetation, and may travel long distances before emerging again at lower levels in springs or through the top-soil. Here it again runs off, or is evaporated, or is transpired.

Thus, there exists a vast underground reservoir of water, and this accounts for the fact that streams continue to flow and vegetation continues to survive rainless periods. By far the greatest proportion of water leaving the ground is evaporated or transpired. The remainder runs off into streams, and it is this which, in the absence of wells, supplies the whole of the water for man's industrial and domestic uses. In Figure 3 is shown the distribution of major ground water and water-logged areas, together with run-off statistics. It is easy to realize from this and the preceding maps that destructive floods will occur most frequently where there is an abundance of run-off ("plus" areas), and that droughts, though they can also be serious in humid areas, are, for the most part, characteristic of areas of low run-off ("minus" areas).

If we compare these indications of where water is available with the distribution of population, as shown in Figure 4, it is apparent that man has adapted himself in large measure to the pattern set by nature; but not everywhere. In California, for instance, two-thirds of the available water is in the northern half of the state, two thirds of the population in the southern half. But man's ingenuity has impounded surface waters and tapped ground water supplies; and he is even going so far as to attempt to make his own rain by cloud seeding.

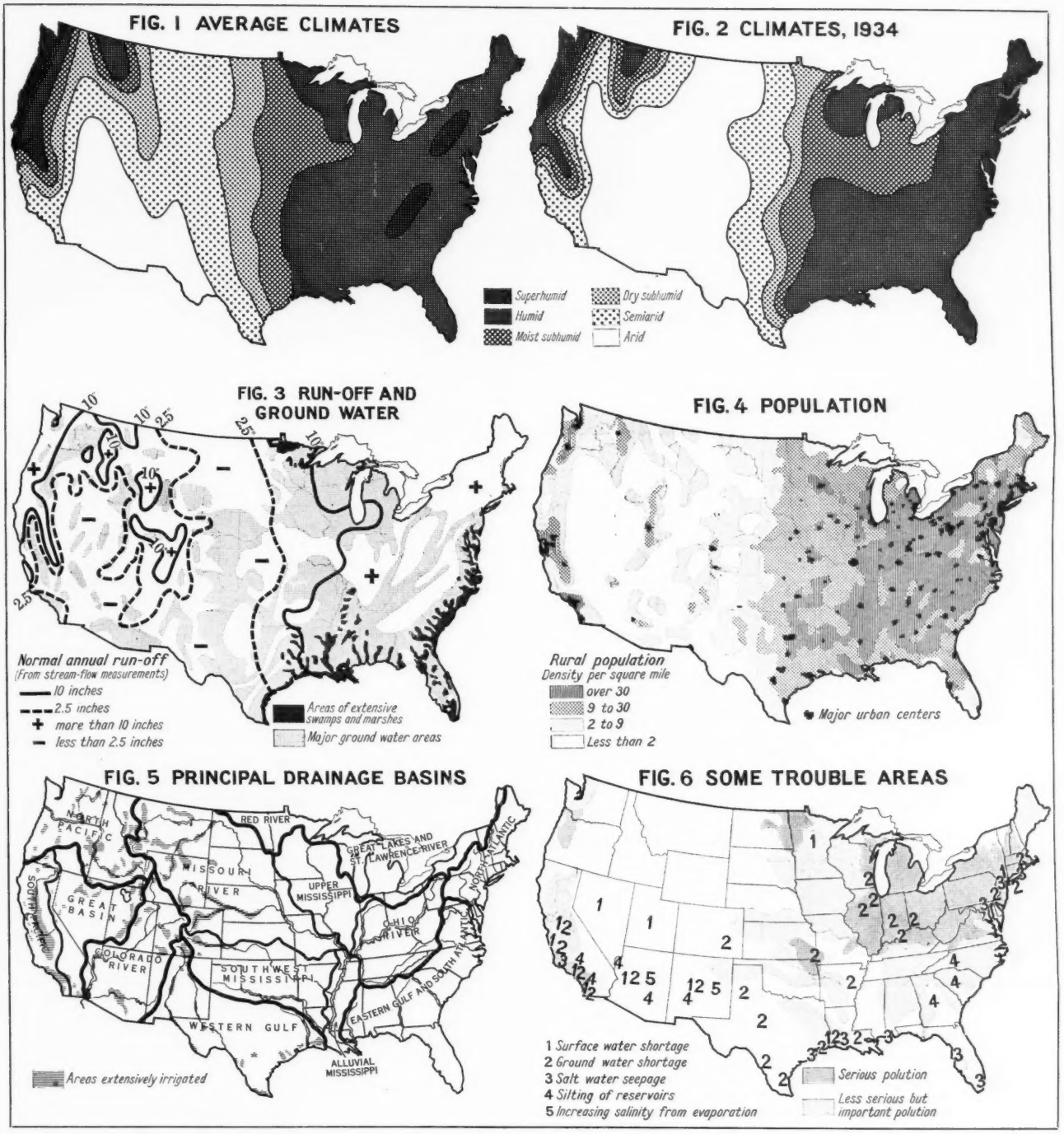
Though less than 1 per cent of the land area of the United States has been or should be irrigated, without irrigation the state of Utah could only have been settled sparsely, and the luxuriant fruits of Southern California could not have been grown. Where water is in excess, land has been drained to permit extensive cultivation, as in Michigan. Dams, huge reservoirs and long aqueducts, the Hoover Dam and Lake Mead among others, and the pipe lines to Los Angeles, have brought water to arid regions and to our cities, have provided power for electricity, and have helped in flood control. Extensive use of ground water has been made possible by improvements in well drilling and pumping techniques. Many of our large cities, Houston, for instance, depend entirely on ground water.

Yet man has been in the past thoughtless and wasteful of water and because he has diverted so much of it to fill the needs of an unevenly distributed and ever expanding population it is over-used in many places and dangerously polluted. Conditions have in fact become sufficiently serious to warrant national concern.

Indiscriminate deforestation, over-grazing, and growing the wrong crop in the wrong soil and in the wrong way are major causes of our worries. Water that should be slowly sinking into forested and grass-covered ground is running off and washing away with it millions of tons of precious top-soil. Notorious in this respect are the conditions brought about by poor farming practice in the dry sub-humid areas of the Middle West. Accelerated erosion on denuded slopes has caused abnormal silting in valleys and reservoirs. In North Carolina, for instance, where soil erosion is far advanced, some reservoirs have already filled up.

Increased use of water and poor planning have created serious deficiencies in many places. The exceptional drought of last winter made New Yorkers uncomfortably aware of this. The plight of the coastal cities of southern California is well known. The Los Angeles Metropolitan Water District seeks its water from as far away as the Colorado River; but even with the additional full use of local ground sources the amount now appears insufficient for future development and there has been serious talk of distilling sea water and of building a 1100-mile aqueduct to tap the Columbia River. The draft on ground-water storage has been so great that wells in the Long Beach area now are as much as 75 feet below sea level and salt water is intruding. In the Estancia Valley, N.M., where, against warning by competent authority, irrigation is still on the increase, water levels are sinking. So, too, in Tucson, Arizona, where the population has trebled in the last ten years.

In the Lake Charles area of Louisiana declining water levels and increasing salt content have followed heavy use of ground water for irrigating the rice fields. On the New England seaboard excessive pumpage for industrial purposes also has led to salt encroachment. In the Middle West, Chicago, Milwaukee, Minneapolis–St. Paul, and Louisville are among cities that show a declining water table. In the last named a particularly critical situation arose dur-



ing the war from over-use of water for hastily established industries. The southern High Plains of Texas, where large areas are irrigated from wells, is becoming one of the most critical areas.

Figure 6 shows some of the trouble spots, and indicates that water pollution is a major problem in areas of dense population and industry. The re-use of water without purification may constitute a menace to public health, recreation, crop cultivation, the fishing industry, and even river navigation. The Mahoning River flowing through Youngstown, Ohio, is an extreme instance. Water used by the steel industry for cooling is used sometimes as many as ten times and on occasion this has raised the temperature of the river to 140° F.

To all these problems must be added the strife